



# ICYNENE™

HEALTHIER, QUIETER, MORE ENERGY EFFICIENT\*

## THE ICYNENE® ADVANTAGE

### APPLICATION CASE STUDY: A PARADIGM FOR SUSTAINABLE HEALTHCARE DESIGN *-The Darling Home for Kids Provides a Natural Healing Environment for Patients and Family*



#### **Synopsis:**

- ✓ Allowed for HVAC rightsizing to increase energy efficiency and improve indoor air quality
- ✓ Reduced sound transmission from surrounding neighborhood activity
- ✓ Provided advanced moisture management to reduce the potential for related problems like mold and mildew growth
- ✓ Lessened environmental impact during construction



## Overview:

### The Home

The construction of *The Darling Home for Kids* (formerly *Rose Cherry's Home for Kids*) began on November 5, 2003 and is the culmination of 6 years of dedication to create a facility designed for children with life-threatening illness. The Home is the only hospice and respite center in Ontario, Canada that provides a continuum of care and support from diagnosis through to palliation. Providing a comprehensive coordinated program of both respite and palliative care, the Home also offers families educational counseling and bereavement support during their time of need. Located within a biosphere reserve area of Milton, Ontario, less than 50 miles west of Toronto, *The Darling Home for Kids* is a paradigm for sustainable healthcare design. Architect firm, Urbana Architects Corporation (an HOK Worldwide alliance partner), and construction firm, PCL Constructors, integrated Green Building materials that are respectful of the environmental and health considerations of this project. Their specifications included ICYNENE LD-C-50™†, the spray-in-place, soft foam insulation and air barrier material.



*The Darling Home for Kids* is located within a tranquil biosphere reserve in Milton, Ontario, Canada.



Set in a heavily wooded, UNESCO-designated biosphere reserve, Green Building issues and long-term sustainability were extremely important during the design and construction phase.

### Floor Plan Schematics

This 1½ – storey building provides accommodation for 6 children at a time, making it possible for the Home's staff to fully attend to the individual needs of each child and family. The first storey consists of 11 rooms:

- 2 respite rooms, each room accommodates 2 children
- Shared washroom with wheel-in shower
- 2 palliative suites, each room accommodates 1 child and family
- Tub room with hydraulic bathtub
- Family room for all children and family members to congregate
- Nursing area
- Kitchen with integrated eating area
- Common washroom
- Laundry/concierge room

The partial second storey is reserved for administrative functions. Altogether, the building is 7,500 square feet and demonstrates how modern construction can harmonize with a habitable earth and preserve the functional integrity of the landscape.



*Icyne was selected because it delivered all the benefits of sustainable building and design, including: maximum IAQ, optimal energy efficiency, increased thermal comfort, sound attenuation, and seamless integration with other building components (such as the HVAC system).*



*The always colorful Don Cherry (Canadian hockey commentator and husband of the Home's original namesake, Rose Cherry) gives his "thumbs-up" approval when the Icyne Licensed Dealer, Inseal Contracting, showed up to spray Icyne.*

**The Environment**

The Niagara Escarpment Biosphere Reserve is one of only 12 such reserves in Canada, and is part of a network of more than 400 similar reserves in 95 countries. Comprised of mountains, streams, scenic valleys, waterfalls, woodlands and natural areas, the Escarpment contains more than 300 bird species, 53 mammals, 90 fish and 37 types of wild orchids.

**The Sustainable Challenge:**

Urbana Architects was tasked with designing a non-institutional setting for the children and their families amidst 77 acres of heavily treed land within the UNESCO-designated biosphere reserve. The key design objective was to preserve the existing features of the site and provide for low-maintenance and low-impact landscaping. Antonio Santini, project Architect, was challenged with specifying green building materials that would achieve all the benefits of proper building design and preserve a sterile and healing environment for patients, families and staff. His objectives included:

- Lessen environmental impact during construction by specifying building materials that are free of carcinogens and toxic emissions and that reduce the need for other construction material
- Deliver advanced moisture management to minimize the potential for mold and mildew growth
- Reduce air infiltration to achieve HVAC rightsizing and increase energy efficiency
- Maintain relative humidity and ambient temperature at required levels to ensure occupant comfort
- Reduce sound intrusion from nearby neighborhood activities
- Allow for required treatment of ventilation air, including: cooling, dehumidifying, reheating, humidifying and filtration during shoulder seasons

**Building Envelope Design: Considerations and Specifications**

Healthcare facilities, such as *The Darling Home for Kids*, must pay particular attention to indoor air quality (IAQ) because poor IAQ can adversely affect patients with depressed immune systems and other illnesses. For this reason, the Home has very specific requirements for ventilation and filtration to dilute and remove contamination such as airborne microorganisms and viruses, hazardous chemicals, and radioactive substances. The ventila-



*Icynene was so effective at minimizing air transport that it eliminated the need for additional sealing material.*



*Incorporated with a properly sized HVAC system, Icynene minimizes the potential for condensation and related problems like mold growth.*

tion requirement for the Home is 25 cubic feet per minute (CFM) per person with 6 filtered air changes per hour (ACH). Design conditions also specify that in the winter, the temperature is to be 72° Fahrenheit with relative humidity between 40-50% and in the summer, the temperature is to be 74° Fahrenheit with the same relative humidity level.

Mr. Santini selected Inseal Contracting Inc. (Mississauga, ON) to install Icynene insulation and air barrier to the roof assembly and exterior walls of the Home. He determined that the high-performance properties of Icynene delivered all the benefits of sustainable building and design, including: improved indoor air quality, optimal energy efficiency, increased thermal comfort, sound attenuation, and seamless integration with other building components (such as the HVAC system).

The Design recommendation included:

- R-20 (5 1/2 inches) of Icynene applied to the exterior walls
- R-40 (11 inches) of Icynene applied to all cantilevered overhangs and the entire roof assembly
- Size and load reduction for the HVAC system
- Well-water system to supply potable water
- Septic sewage treatment system

## **Results: Healthy and Efficient Operation**

### **Energy Performance**

#### Mechanical Systems Reduction and Energy Conservation

Icynene's air-sealing properties enabled PCL Constructors to minimize random air leakage and achieve HVAC rightsizing. Despite the higher levels of air changes required per hour, an energy analysis demonstrated that HVAC operating costs amounted to 37% less than if the building was insulated with conventional insulation<sup>1</sup>. With Icynene, the builder can incorporate a smaller HVAC system that uses less energy to heat and cool the building, resulting in initial savings of equipment costs as well as ongoing savings of utility costs.



**Environmental Performance:**

Efficient Material Use

A key goal of sustainable building is to reduce the amount of material used in construction and minimize the impact to the waste stream. Blower doors tests have proven that, of the total reduction in airflow through a building envelope, 93% is achieved by Icynene once the material is applied to stud walls with exterior sheathing and brick facing in place (prior to drywall installation). Because Icynene provides a significant barrier to airflow, it eliminated the need for labor-intensive sealing material during the construction of *The Darling Home for Kids*. In just one step and using less construction material, Icynene helped PCL Constructors deliver advanced thermal comfort and protection against costly air leakage. As an open-celled material, Icynene is easily compacted, dramatically reducing the waste volume in comparison to other insulation materials.

Impact on Surrounding Ecosystems

Icynene made it easy to uphold the principles of sustainable design and construction because it is 100% water-blown, emits no harmful emissions, and reduces waste volume during construction. It also helps reduce the building’s annual operating emissions because the material does not off-gas over time. Icynene maintains its efficiency with no loss of R-value to provide total thermal comfort for its occupants today and for years to come. Conventional insulation, on the other hand, can deteriorate as time passes and may no longer perform as it did when initially installed. So, selecting products that provide longevity, like Icynene, will eliminate the need for the installation and/or reinstallation of additional material in the future.

Furthermore, Urbana’s design softened the impact by placing the new facility on the area of a previous dwelling. The building envelope fits into the surrounding landscape and maintains natural topography drainage.



*Icynene softly expands to 100 times its initial volume to completely fill all gaps and crevices that compromise airtightness. Areas that are considered difficult to insulate with conventional insulations are no obstacle for Icynene. Attics, ceilings, and walls can be quickly and easily insulated.*



*With Icynene sprayed into the exterior wall cavities, the sound from the quarry 2 miles away will be minimized, thereby ensuring the comfort of the residents and staff of the Home.*



**Indoor Environmental Quality:**

Icnene not only supported the local and distant ecosystems while reinforcing the project’s design principles; but, it also contributed to individual comfort and a healthier indoor environment.

Reduced circulation of dust and minimized entry of outdoor pollens/pollutants

In a susceptible person, a normally harmless substance, such as pollen or house dust, is perceived as a threat to the immune system. As a complete air barrier, Icnene created an airtight building envelope to seal out dust, allergens, odors and pollutants and minimize disruptions for patients who suffer from respiratory illness or depressed immune systems. The integration of Icnene, 6 filtered air changes per hour, and proper mechanical ventilation means that the occupants of *The Darling Home for Kids* can control the quality of the indoor air they breathe. This will also ensure that there is always proper air movement and sufficient changes of air within the structure.

Provided increased sound control

The Dufferin Aggregates’ Milton Quarry, a major supplier of aggregate resources to the Greater Toronto Area, operates within 2 miles of the Home. Icnene effectively minimized airborne sounds such as noises originating from the transport and operations in the quarry, as well as other neighborhood activity that would otherwise invade this living space.



*Icnene was sprayed into the cantilevered overhangs and roof assembly to prevent warm, moist air from coming into contact with cooler surfaces, minimizing the potential for condensation*



*Icnene adheres to common construction materials. Because it does not off-gas, Icnene maintains its rated R-value and energy performance levels over time.*

Improved moisture resistance

Up to 99% of the total moisture movement through a building envelope is carried in air. As a qualified air barrier, Icnene helps reduce the movement of moisture through the building envelope along with potential problems such as mold growth. Combined with proper mechanical ventilation, Icnene helps control the indoor relative humidity. Where high humidity and vapor drive might otherwise challenge the effectiveness of conventional insulation, Icnene delivers advanced moisture management to improve indoor air quality. Also, Icnene was tested by Texas Tech University and found not to be a food source for mold.



### **Icynene Delivers High Performance for Sustainable Healthcare Design:**

- ✓ Minimizes air leakage and allows for HVAC equipment rightsizing
- ✓ Increases energy efficiency
- ✓ Delivers advanced moisture management to reduce the potential for related problems like mold
- ✓ Improves indoor air quality
- ✓ Provides sound attenuation
- ✓ Supports health and environmental considerations for sustainable design and construction

### **Icynene Insulation**

Icynene foam insulation products are sprayed into/onto walls, crawlspaces, underside of roofs, attics and ceilings by Icynene Licensed Dealers. They expand in seconds to create superior insulating and air-sealing results. Every crevice, crack, electrical box, duct and exterior penetration is effortlessly sealed to reduce energy-robbing random air leakage. Icynene products adhere to the construction material and remain flexible so that the integrity of the building envelope seal remains intact over time.

Icynene is ideal for residential, commercial, industrial and institutional indoor applications. The products are:

**Healthier:** Icynene spray foam products are CHPS (Collaborative for High Performance Schools) EQ 2.2 Section 01350 Compliant, meeting nationally recognized requirements as Low-Emitting Materials (LEM) and Environmentally Preferable Products (EPP). Icynene spray foam products are 100% water-blown and contain no HFCs or PBDEs. Icynene seals out dust, pollen and other allergens from entering the structure. As air barriers, Icynene products minimize the potential for airborne moisture build-up and related problems such as mold and mildew.

**Quieter:** By air-sealing the building envelope, Icynene effectively minimizes airborne sounds. Icynene is perfect for reducing unwanted noises from home theaters, plumbing runs and playrooms.

**More Energy Efficient:** Icynene delivers up to 50% more energy savings versus traditional insulation.

Information about Icynene insulation can be obtained by calling Icynene Inc. (800-758-7325), visiting the website [icynene.com](http://icynene.com), or contacting your local Icynene Licensed Dealer.

† The Icynene product installed and addressed in this project example is Icynene's classic formula, ICYNENE LD-C-50<sup>™</sup>.

Endnotes:

1. REM/Design – Residential Energy Analysis Software v10.21



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